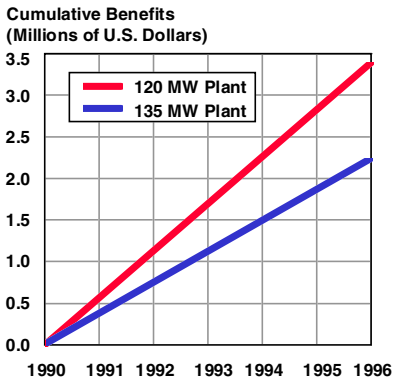
Benefits

In today's competitive business environment, demands on water resources are increasing, operating budgets are shrinking, and customer needs are expanding. Hydro utilities must optimize hydraulic performance, while meeting environmental objectives in a cost-effective manner. WaterView, a proprietary knowledge management system for hydro optimization and machine condition monitoring, is your best solution for balancing energy, economics, and the environment.

WaterView's unique concept delivers on-line data and graphics that compare your plant's current performance with its optimum potential. It identifies resources wasted, calculates dollars lost, and monitors environmental variables.

Representative Benefits Achieved From Improved Performance for Tributary Hydro Plants
(Based on $25/MWH Incremental Electric Rates)



Using WaterView, hydro operators can increase hydro generation (typically, 1% or more for main river plants and 2% to 5% for tributary plants), minimize vibration and related maintenance, and reduce cavitation damage, while meeting environmental goals.

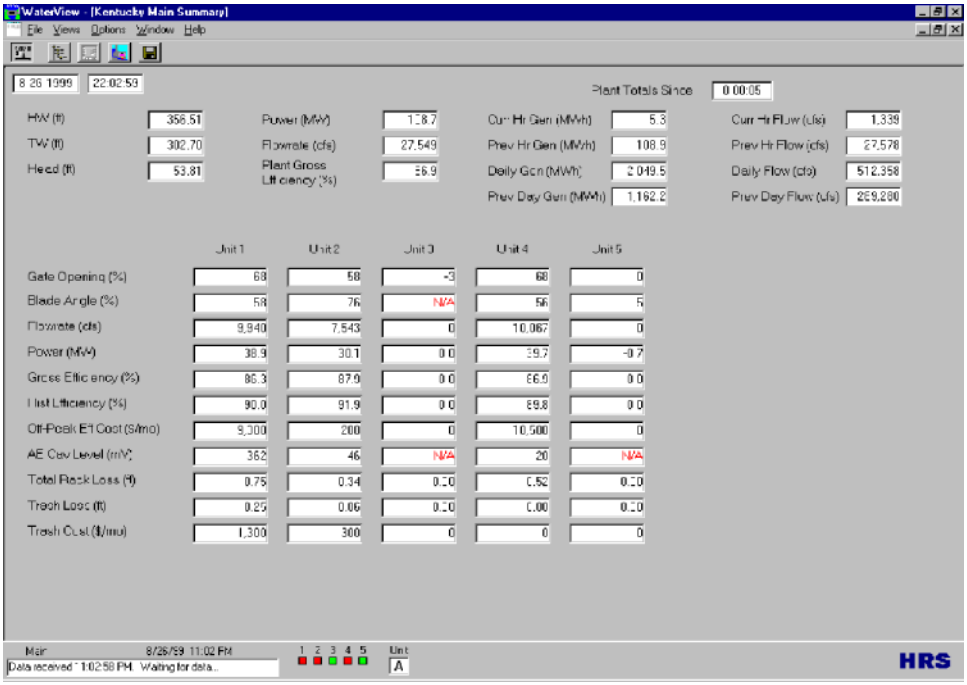
General

WaterView was jointly developed by two companies that understand hydro power. Voith Siemens Hydro Power Generation, Inc., is experienced in designing, manufacturing, and commissioning hydroturbines and digital control systems. The Tennessee Valley Authority, the nation's largest wholesale producer of electricity, operates 30 hydroelectric plants, including five pump-turbines. TVA's Resource Management business is experienced in instrumentation systems, software development, performance testing, monitoring, and optimization of hydro facilities.

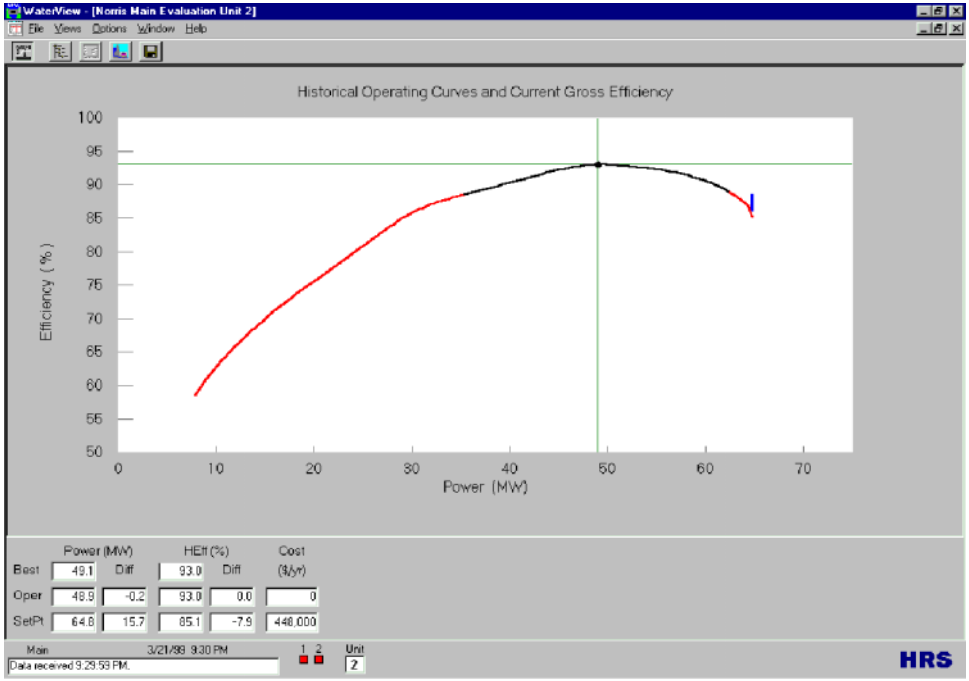
Modules

WaterView is a proprietary, modular, PC-based, hardware/software system, consisting of the Core (Efficiency) Module, the multi-unit Optimization Module, the Trash Rack Module, and additional modules for Kaplan optimization, environmental performance, maintenance-cost estimation, and Safe Passage™ of fish. WaterView's unique modules are the subject of a variety of U.S. patents and patents-pending.

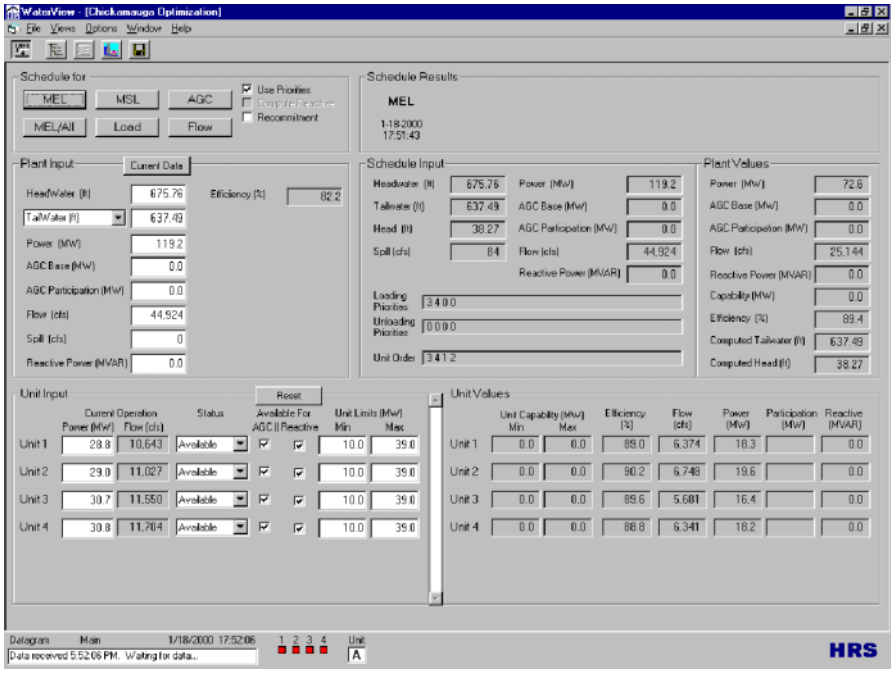
The ***Core (Efficiency) Module*** collects real-time data using network-based data acquisition equipment and transducers located throughout the plant, or using the existing SCADA equipment. The Summary screen presents plant and unit operating data in an easily understandable format.



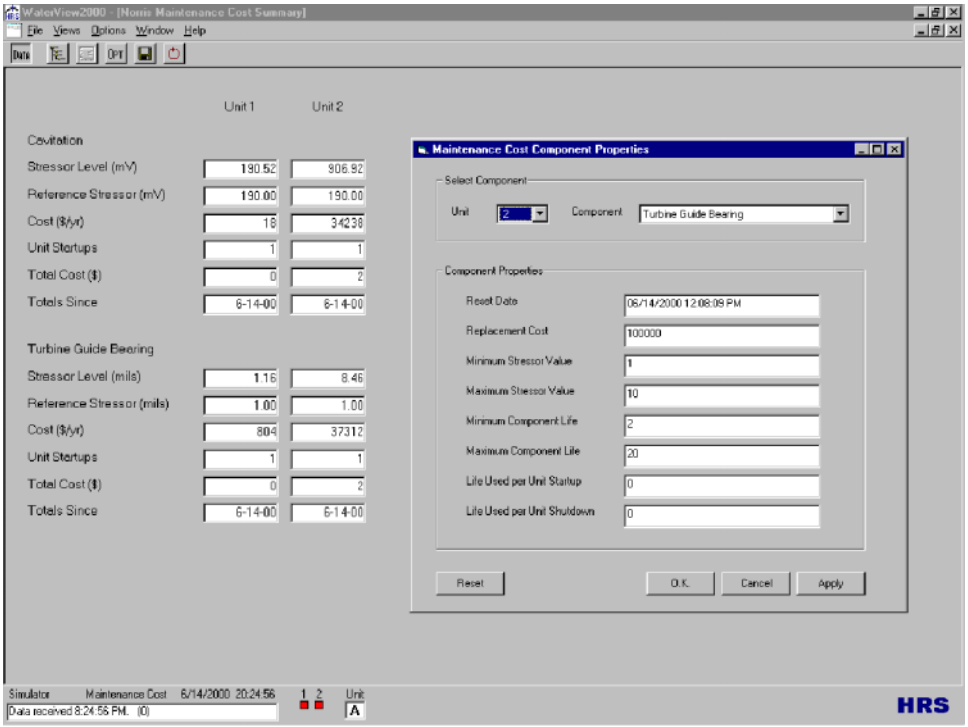
The Evaluation screen graphically displays the overall efficiency of each unit. The tabulated data shows the wasted resource (efficiency loss) and unrealized revenue (cost) for less efficient operation. A “What If” cursor allows the user to compare other operating points to the peak efficiency point. The on-line data provides immediate feedback to the operator on the value of potential operating improvements.



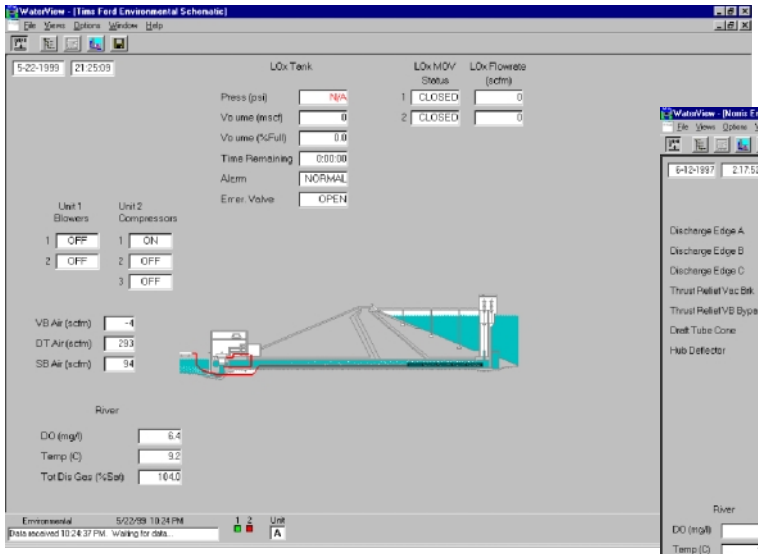
The multi-unit ***Optimization Module*** can be used "manually" by an operator, or integrated into an automated control system or SCADA system. The module determines the optimized combination of units and operating characteristics, consistent with the plant's constraints. The module considers the unit operating status and the various operating constraints, including loading and unloading priorities, cavitation, tailwater levels, vibration avoidance zones, and generator power or thermal constraints.

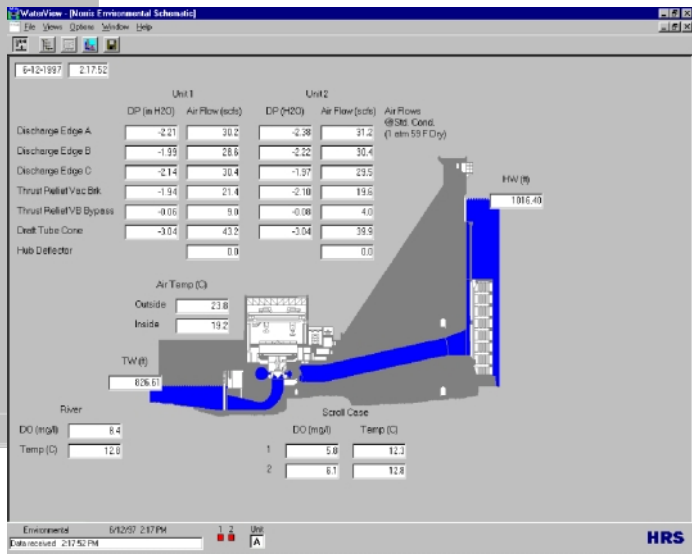


The ***Maintenance-Cost Module*** uses cumulative damage theory and measured parameters, such as bearing vibration, to assess and quantify the effects of varying operating conditions on the maintenance costs. Controlling these costs will be an increasingly important concern as market forces push hydro owner/operators into non-traditional modes of operation.

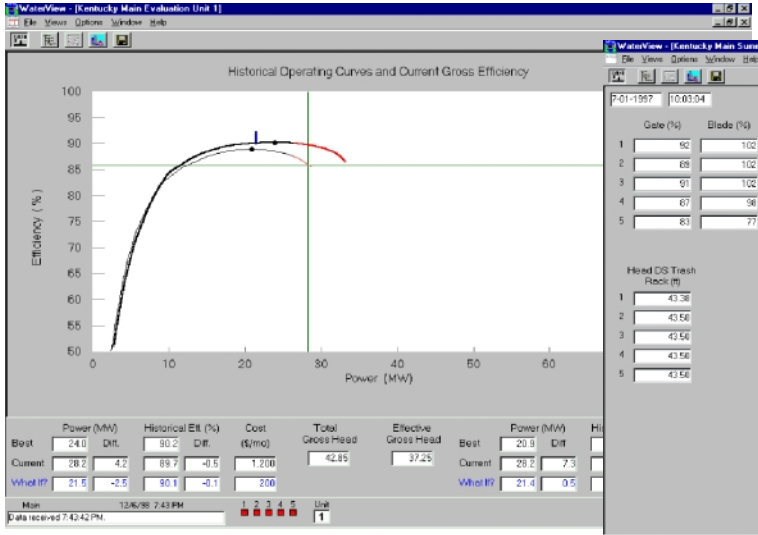


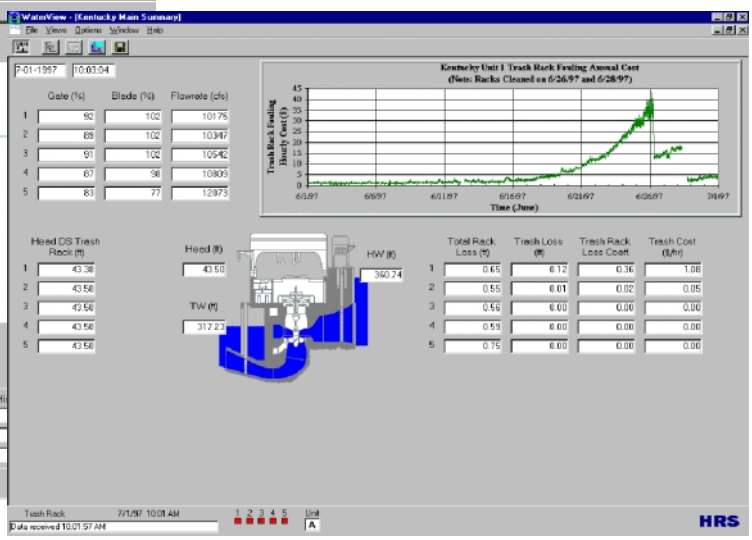
Measurements used by the ***Environmental Module*** typically include dissolved oxygen levels, total dissolved gas levels, water temperatures, oxygen or air flow rates, and the status of auxiliary equipment. The ***Safe Passage Module*** optimizes total plant energy production, consistent with high levels of fish survival. By using data from these modules, the operator can evaluate the environmental performance of the hydro units and take appropriate actions to achieve environmental objectives, while minimizing the impact on operating efficiency.





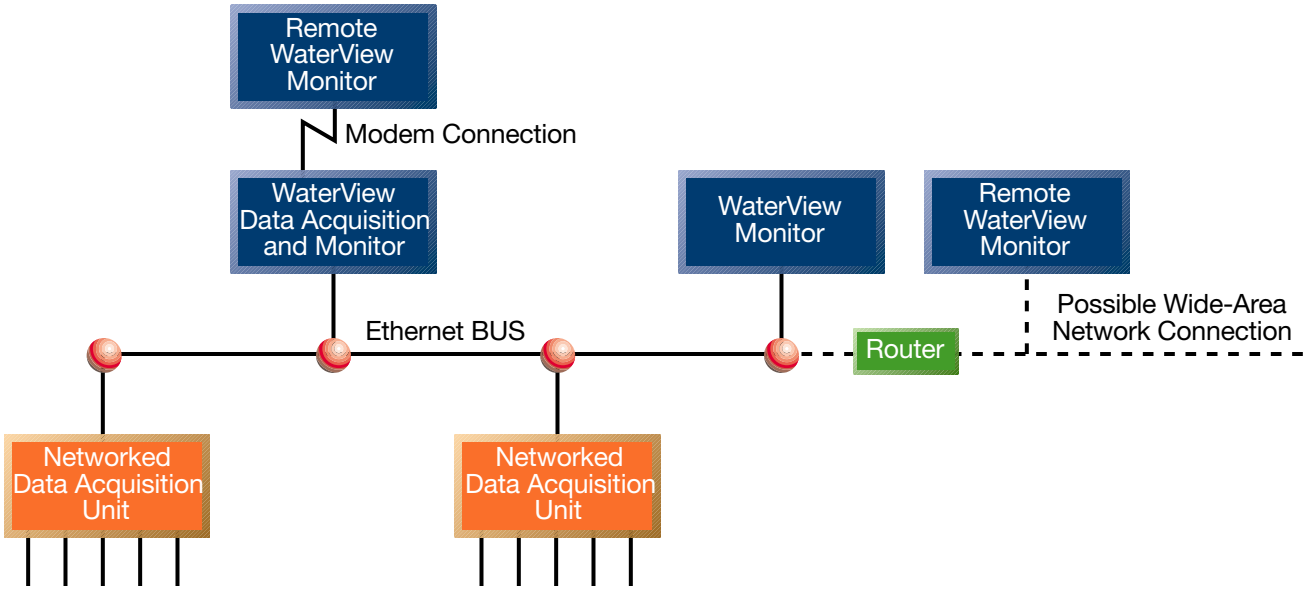
The ***Trash Rack Module*** indicates the total head loss across the trash rack, the portion of the total head loss due to trash, and a trash rack loss coefficient for evaluating the rate at which trash is accumulating. Trash rack losses are also expressed in economic terms. For a typical 5-unit, 175-MW, main-river hydro plant, trash rack losses of one foot represent an annual revenue loss of $500,000 (assuming an energy value of $25/MWh). The Trash Rack Module displays the expected performance and the trash-affected performance. This allows the multi-unit Optimization Module to use the actual, trash-affected performance for each unit in optimizing the plant's operation.



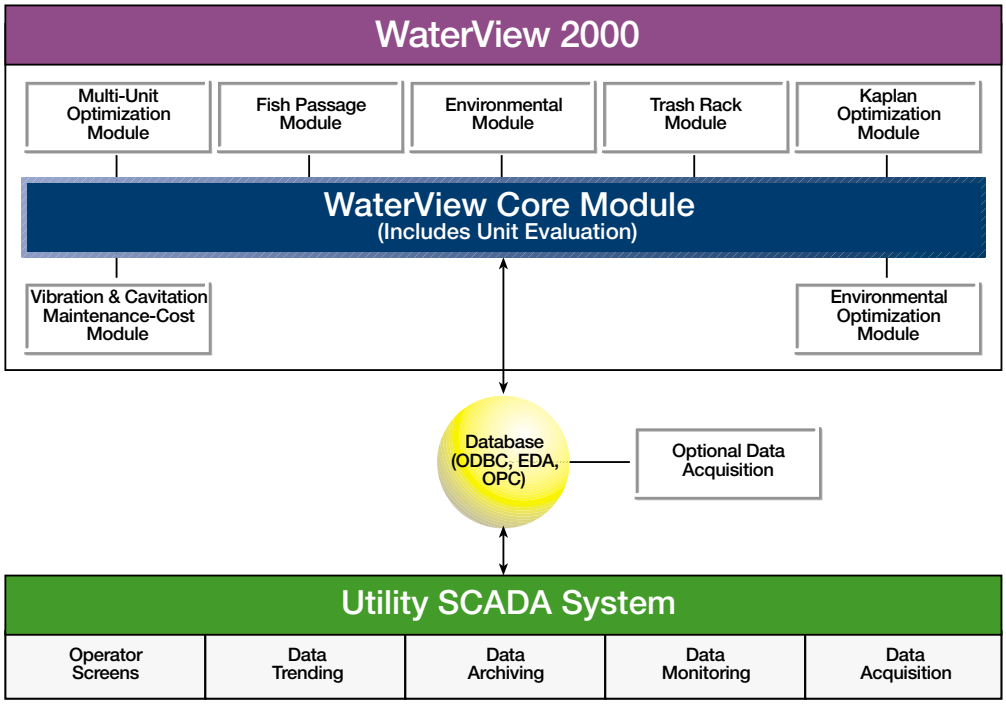


Configurations

This schematic shows a typical WaterView installation for a plant with little or no previously existing data acquisition. This “stand-alone” version of WaterView uses one or more IBM-compatible PCs, running on a Windows NT® local area network. Network hardware and software are included with the basic package.



The WaterView®2000 system integrates with a variety of SCADA systems, such as Intellution FIX®, WonderWare®, WinCC®, and RSView®. WaterView 2000 receives its data and schedule requests from the SCADA system through a shared database. WaterView 2000 computes, for example, the optimized combination of units to satisfy the schedule request and returns the recommended unit loadings to the database for retrieval and execution by the control system.



Recommended Hardware

CPU:	P5-500 or faster (minimum P5-200)
RAM:	Recommended 128 MB (minimum 64 MB)
Hard Drive:	10 GB (minimum 5 GB)
OS:	Windows NT®
Network:	Ethernet Adapter
Video:	4 MB RAM
Monitor:	17-inch
Modem:	56,000 baud (for remote support)

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